

## CLAIMS:

What is claimed is:

- 1 1. An apparatus comprising:  
2 a main memory for storing data;  
3 one or more I/O devices for receiving data from or sending  
4 data to said main memory;  
5 a control unit for controlling said I/O devices;  
6 an I/O processor (IOP) for controlling I/O operations for  
7 sending data between said main memory and said I/O devices;  
8 disparate channels between said IOP and said control unit,  
9 said disparate channels including multiple channel paths for  
10 carrying data between said main memory and said I/O devices  
11 during said I/O operations; and  
12 a computer program executed by said IOP for assigning a path  
13 weight to selected ones of said channel paths whereby the next  
14 channel path to carry data between said main memory and said I/O  
15 devices is selected.
- 1 2. The apparatus of claim 1 wherein said disparate channels  
2 includes more than one type of channels.
- 1 3. The apparatus of claim 1 wherein said disparate channels  
2 comprises one or more channel types including ESCON channels,  
3 FICON bridge (FCV) channels, or FICON Native (FC) channels.
- 1 4. The apparatus of claim 2 wherein said computer program  
2 includes an algorithm for assigning a path weight to a channel  
3 path candidate dependent upon the type of channel containing the  
4 channel path candidate.

1 5. The apparatus of claim 4 wherein the next channel path  
2 candidate is selected by a round robin algorithm.

1 6. The apparatus of claim 4 comprising channel busy data (CBD)  
2 stored by each channel for containing the status of channel  
3 paths in the respective channel, and an IOP copy of said CBDs  
4 stored by said IOP, and said computer program includes an  
5 algorithm for using data in said CBDs for assigning a path weight  
6 to a channel path candidate.

1 7. The apparatus of claim 6 wherein said computer program  
2 classes a channel path candidate as a great candidate, a bad  
3 candidate, or an OK candidate dependent on the value of the given  
4 channel path's path weight value, said computer program further  
5 including an algorithm for selecting the channel path candidate  
6 to initiate the I/O operation on if it is classed as a great  
7 candidate, evaluating the next candidate if it is classed as an  
8 OK channel path or a bad channel path, or selecting the OK  
9 candidate with the least path weight to initiate the I/O  
10 operation on if there are no great candidates found while  
11 rejecting any bad candidates.

1 8. The apparatus of claim 7 further comprising multiple IOPs,  
2 each channel path having an affinity to one IOP, a work queue  
3 having work elements for each IOP, and said computer program  
4 comprises a loop for determining the best class of available  
5 candidates, and from that class picking the candidate that has  
6 affinity to the IOP with the least number of work elements on its  
7 work queue.

1 9. A data processing system having a main memory for storing  
2 data, one or more I/O devices for receiving data from or sending  
3 data to said main memory, and an I/O processor (IOP) for

4 controlling I/O operations for sending data between said main  
5 memory and said I/O devices, an apparatus for selecting paths  
6 between the main memory and the I/O devices comprising:  
7 disparate channels between the IOP and the I/O devices, said  
8 disparate channels including multiple channel paths for carrying  
9 data between the main memory and the I/O devices during the I/O  
10 operations; and  
11 a computer program executed by said IOP for assigning a path  
12 weight to selected ones of said channel paths whereby the next  
13 channel path to carry data between said main memory and said I/O  
14 devices is selected.

1 10. The apparatus of claim 9 wherein said disparate channels  
2 includes more than one type of channels.

1 11. The apparatus of claim 9 wherein said disparate channels  
2 comprises one or more channel types including ESCON channels,  
3 FICON bridge (FCV) channels, or FICON Native (FC) channels.

1 12. The apparatus of claim 10 wherein said computer program  
2 includes an algorithm for assigning a path weight to a channel  
3 path candidate dependent upon the type of channel containing the  
4 channel path candidate.

1 13. The apparatus of claim 12 wherein the next channel path  
2 candidate is selected by a round robin algorithm.

1 14. The apparatus of claim 12 comprising channel busy data (CBD)  
2 stored by each channel for containing the status of channel  
3 paths in the respective channel, and an IOP copy of said CBDs  
4 stored by said IOP, and said computer program includes an  
5 algorithm for using data in said CBDs for assigning a path weight  
6 to a channel path candidate.

1 15. The apparatus of claim 14 wherein said computer program  
2 classes a channel path candidate as a great candidate, a bad  
3 candidate, or an OK candidate dependent on the value of the given  
4 channel path's path weight value, said computer program further  
5 including an algorithm for selecting the channel path candidate  
6 to initiate the I/O operation on if it is classed as a great  
7 candidate, evaluating the next candidate if it is classed as an  
8 OK channel path or a bad channel path, or selecting the OK  
9 candidate with the least path weight to initiate the I/O  
10 operation on if there are no great candidates found while  
11 rejecting any bad candidates.

1 16. The apparatus of claim 15 further comprising multiple IOPs,  
2 each channel path having an affinity to one IOP, a work queue  
3 having work elements for each IOP, and said computer program  
4 comprises a loop for determining the best class of available  
5 candidates, and from that class picking the candidate that has  
6 affinity to the IOP with the least number of work elements on its  
7 work queue.

1 17. A method for selecting channel paths in a data processing  
2 system having a main memory for storing data, one or more I/O  
3 devices for receiving data from or sending data to said main  
4 memory, an I/O processor (IOP) for controlling I/O operations for  
5 sending data between said main memory and said I/O devices, and  
6 disparate channels between the IOP and the I/O devices, said  
7 disparate channels including multiple channel paths for carrying  
8 data between the main memory and the I/O devices during the I/O  
9 operations, said method comprising:  
10 assigning a path weight to selected ones of said channel  
11 paths; and

12        selecting the next channel path to carry data between said  
13 main memory and said I/O devices based on said path weight.

1    18. The method of claim 17 comprising including more than one  
2 type of channel within said disparate channels.

1    19. The method of claim 17 further comprising including within  
2 said disparate channels, one or more channel types including  
3 ESCON channels, FICON bridge (FCV) channels, or FICON Native (FC)  
4 channels.

1    20. The method of claim 18 further comprising assigning a path  
2 weight to a channel path candidate dependent upon the type of  
3 channel containing the channel path candidate.

1    21. The method of claim 20 further comprising selecting the next  
2 channel path candidate by a round robin algorithm.

1    22. The method of claim 18 comprising storing channel busy data  
2 (CBD) by each channel, said CBD containing the status of channel  
3 paths in the respective channel, and storing by said IOP, an IOP  
4 copy of said CBDs, and said using data in said CBDs for assigning  
5 a path weight to a channel path candidate.

1    23. The method of claim 22 further comprising:  
2        classifying a channel path candidate as a great candidate, a  
3 bad candidate, or an OK candidate dependent on the value of the  
4 given channel path's path weight value; and  
5        selecting the channel path candidate to initiate the I/O  
6 operation on if it is classed as a great candidate, evaluating  
7 the next candidate if it is classed as an OK channel path or a  
8 bad channel path, or selecting the OK candidate with the least

9 path weight to initiate the I/O operation on if there are no  
10 great candidates found while rejecting any bad candidates.

1 24. The method of claim 23 wherein said data processing system  
2 includes multiple IOPs, each channel path having an affinity to  
3 one IOP, a work queue having work elements for each IOP, and said  
4 method further comprises:

5 performing a loop for determining the best class of  
6 available candidates; and

7 from that class, picking the candidate that has affinity to  
8 the IOP with the least number of work elements on its work queue.

1 25. A program product usable with in a data processing system  
2 having a main memory for storing data, one or more I/O devices  
3 for receiving data from or sending data to said main memory, an  
4 I/O processor (IOP) for controlling I/O operations for sending  
5 data between said main memory and said I/O devices, and disparate  
6 channels between the IOP and the I/O devices, said disparate  
7 channels including multiple channel paths for carrying data  
8 between the main memory and the I/O devices during the I/O  
9 operations, said program product comprising:

10 A computer readable medium having recorded thereon computer  
11 readable program code means for performing the method comprising:

12 assigning a path weight to selected ones of said channel  
13 paths; and

14 selecting the next channel path to carry data between said  
15 main memory and said I/O devices based on said path weight.

1 26. The program product of claim 25 wherein said method  
2 comprises including one or more type of channel within said  
3 disparate channels.

1 27. The program product of claim 25 wherein said method further  
2 comprises including within said disparate channels, one or more  
3 channel types including ESCON channels, FICON bridge (FCV)  
4 channels, or FICON Native (FC) channels.

1 28. The program product of claim 26 wherein said method further  
2 comprises assigning a path weight to a channel path candidate  
3 dependent upon the type of channel containing the channel path  
4 candidate.

1 29. The program product of claim 28 wherein said method further  
2 comprises selecting the next channel path candidate by a round  
3 robin algorithm.

1 30. The program product of claim 26 wherein said method  
2 comprises storing channel busy data (CBD) by each channel, said  
3 CBD containing the status of channel paths in the respective  
4 channel, and storing by said IOP, an IOP copy of said CBDs, and  
5 said using data in said CBDs for assigning a path weight to a  
6 channel path candidate.

1 31. The program product of claim 30 wherein said method further  
2 comprises:

3 classifying a channel path candidate as a great candidate, a  
4 bad candidate, or an OK candidate dependent on the value of the  
5 given channel path's path weight value; and

6 selecting the channel path candidate to initiate the I/O  
7 operation on if it is classed as a great candidate, evaluating  
8 the next candidate if it is classed as an OK channel path or a  
9 bad channel path, or selecting the OK candidate with the least  
10 path weight to initiate the I/O operation on if there are no  
11 great candidates found while rejecting any bad candidates.

1. Mr. J. H. Smith  
 2. of the  
 3. City of  
 4. San Francisco  
 5. California  
 6. is  
 7. the  
 8. author  
 9. of  
 10. the  
 11. book  
 12. entitled  
 13. "The  
 14. History  
 15. of  
 16. the  
 17. City  
 18. of  
 19. San  
 20. Francisco  
 21. California  
 22. from  
 23. 1776  
 24. to  
 25. 1898  
 26. and  
 27. the  
 28. early  
 29. history  
 30. of  
 31. the  
 32. State  
 33. of  
 34. California  
 35. from  
 36. 1776  
 37. to  
 38. 1898  
 39. and  
 40. the  
 41. early  
 42. history  
 43. of  
 44. the  
 45. State  
 46. of  
 47. California  
 48. from  
 49. 1776  
 50. to  
 51. 1898  
 52. and  
 53. the  
 54. early  
 55. history  
 56. of  
 57. the  
 58. State  
 59. of  
 60. California  
 61. from  
 62. 1776  
 63. to  
 64. 1898  
 65. and  
 66. the  
 67. early  
 68. history  
 69. of  
 70. the  
 71. State  
 72. of  
 73. California  
 74. from  
 75. 1776  
 76. to  
 77. 1898  
 78. and  
 79. the  
 80. early  
 81. history  
 82. of  
 83. the  
 84. State  
 85. of  
 86. California  
 87. from  
 88. 1776  
 89. to  
 90. 1898  
 91. and  
 92. the  
 93. early  
 94. history  
 95. of  
 96. the  
 97. State  
 98. of  
 99. California  
 100. from  
 101. 1776  
 102. to  
 103. 1898  
 104. and  
 105. the  
 106. early  
 107. history  
 108. of  
 109. the  
 110. State  
 111. of  
 112. California  
 113. from  
 114. 1776  
 115. to  
 116. 1898  
 117. and  
 118. the  
 119. early  
 120. history  
 121. of  
 122. the  
 123. State  
 124. of  
 125. California  
 126. from  
 127. 1776  
 128. to  
 129. 1898  
 130. and  
 131. the  
 132. early  
 133. history  
 134. of  
 135. the  
 136. State  
 137. of  
 138. California  
 139. from  
 140. 1776  
 141. to  
 142. 1898  
 143. and  
 144. the  
 145. early  
 146. history  
 147. of  
 148. the  
 149. State  
 150. of  
 151. California  
 152. from  
 153. 1776  
 154. to  
 155. 1898  
 156. and  
 157. the  
 158. early  
 159. history  
 160. of  
 161. the  
 162. State  
 163. of  
 164. California  
 165. from  
 166. 1776  
 167. to  
 168. 1898  
 169. and  
 170. the  
 171. early  
 172. history  
 173. of  
 174. the  
 175. State  
 176. of  
 177. California  
 178. from  
 179. 1776  
 180. to  
 181. 1898  
 182. and  
 183. the  
 184. early  
 185. history  
 186. of  
 187. the  
 188. State  
 189. of  
 190. California  
 191. from  
 192. 1776  
 193. to  
 194. 1898  
 195. and  
 196. the  
 197. early  
 198. history  
 199. of  
 200. the  
 201. State  
 202. of  
 203. California  
 204. from  
 205. 1776  
 206. to  
 207. 1898  
 208. and  
 209. the  
 210. early  
 211. history  
 212. of  
 213. the  
 214. State  
 215. of  
 216. California  
 217. from  
 218. 1776  
 219. to  
 220. 1898  
 221. and  
 222. the  
 223. early  
 224. history  
 225. of  
 226. the  
 227. State  
 228. of  
 229. California  
 230. from  
 231. 1776  
 232. to  
 233. 1898  
 234. and  
 235. the  
 236. early  
 237. history  
 238. of  
 239. the  
 240. State  
 241. of  
 242. California  
 243. from  
 244. 1776  
 245. to  
 246. 1898  
 247. and  
 248. the  
 249. early  
 250. history  
 251. of  
 252. the  
 253. State  
 254. of  
 255. California